(IC)detector making use of gamma analysis (3%,3mm): measurement and simulationtimes were compared too.

Results: The table shows a comparison of clinically significant DVH points from TPS dose distribution, MC simulation of the nominal plan and of TCS log file.

ROIs - DVH points	DVH values		
	TPS	MC - Nominal	MC - Log File
PTV - D95	52,63	55,97	52,16
Brainstem - D1	53,37	54,71	53,46
Coclea dx - D1	46,42	46,11	50,67
GTV - D95	53,74	54,88	54,14
GTV - Mean dose	54,46	55,69	55,50
Cerebral Tissue - V33	38,67%	34,82%	35,21%

Table: DVH points comparison between TPS dose distribution, MC recalculated dose from nominal plan and MC dose calculation from TCS log files.

In figure a comparison of TPS and MC planar dose distribution with 2DQA measurements is shown. In our protocol, if the passing rate (PR) is above 95% the field is accepted. If it is between 95 and 90% a justification must be added to the QA report to flag the field as accepted. A passing rate below 90% makes the field unacceptable. In the graph 27 fields belonging to 10 patients are analysed. MC has a PR always greater than 95% for every depth showing a good agreement with measurements. TPS results are always in the "grey" area between 90 and 95%. The execution time of a 2DQA with an array of ICs takes almost 1 hour and half; simulations, that can be performed in parallel, take 11 minutes on average.

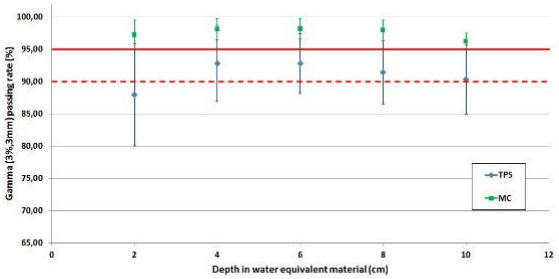

Figure: gamma PR (3%,3mm). Comparison at different depths between TPS (diamonds) and MC (squares) dose distribution with measurements of 27 fields belonging to 10 patients.

Conclusion: We realized a system to verify with an independent calculation algorithm both the nominal plan and the delivered one with the TPS dose distribution. This lets the user to estimate the effects on the dose distribution due to a different algorithm and due to delivery uncertainties of the machine. We proposed a method to drastically reduce 2DQA verification time. Our suggestion is to substitute measurements with simulation that showed a very high accordance in terms of gamma PR (always above 95%); one field per patient may be measured at single depth as an additional safety check.

[1] F Fracchiolla et al,'End to end' validation of a Monte Carlo code for independent dose calculation in a proton pencil beam scanning system Radand Onc, 115, S78-S79, 2015

PO-0805

Proton radiography for the clinical commissioning of the new Gantry2 head support at PSI

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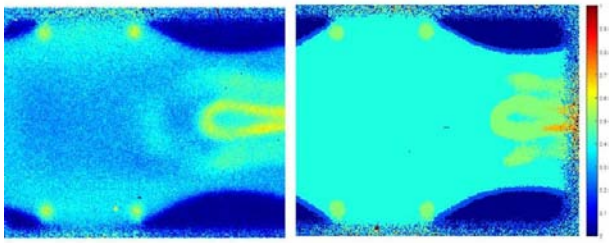
Purpose or Objective: The treatment couches for Gantry2 will support new head pieces for head and neck treatments, the BoS HeadframeTM. Thanks to their geometry and composition (a sandwich of thin carbon layers and light foam), they will increase the flexibility of planning, as they should only minimally disturb proton beams passing through it. Therefore there will be no restrictions in the deliverable gantry angles; posterior targets will be treated in supine position, thus increasing patient comfort, safety (especially for children under anesthesia) and the position accuracy (bite block will be used more often). We describe here the measurement of their Water Equivalent Range (WER) and homogeneity.

Material and Methods: Mono-energetic scanned proton layers (12x20cm2) of 129 MeV up to 145 MeV were delivered through the head support, with the proton dose on exit being measured using a scintillating screen/CCD camera device approach. A reference set of measurements were first performed without the head support with 1 MeV discrete energy steps. The measurements were then repeated for three different positions (head, neck and shoulder) of the head support. A second set of measurements were performed with an energy step of 0.2 MeV for energies between 133-139 MeV, to increase the measurement accuracy. For each acquisition, a 2D map of the maximum values among all the layers was generated, from which the WER of the head support in the different positions could be calculated by subtracting the measurements with and without the frame. WER homogeneity was calculated as the standard deviation of sub-regions of the 2D difference maximum value maps. CT images of the head supports were also imported in the TPS and converted to WER (via HU-Relative Proton Stopping Power calibration curve), to estimate if the planned WER corresponded to the measured values (with no need of synthetic CTs).

Results: WER was found to be between 2.4mm and 7.2mm with an accuracy of 1.0mm or 0.5mm, depending on the measurements energy steps (respectively 1.0 MeV and 0.2 MeV) (Fig). In the three different positions, WER in-homogeneity was lower than 1.0mm (respectively 0.36mm, 0.99mm and 0.40mm). The differences of WER between measured and TPS values were also below 0.5 mm (0.2 MeV step) and 1.4 mm (1 MeV step).



Conclusion: The described method was accurate, fast and reproducible. The results on the thickness and homogeneity of the head frame show that it can be safely and accurately used in clinical operation and the first patients have already been treated.

PO-0806

Optimisation and assessment of the MLC model in the Raystation treatment planning system

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Purpose or Objective: Accurate modeling of the MLC is necessary to achieve a clinically acceptable agreement between dose calculations and measurements in IMRT/VMAT treatment plans. The RayStation TPS uses several parameters to model a MLC but no specific procedure exists on how to perform measurements to optimize them. The aim of this work is to present a fast procedure to optimize the MLC parameters in RayStation v.4.5 and to assess the obtained MLC model.

Material and Methods: A proper set of MLC-collimated fields was designed on a Varian Trilogy linear accelerator equipped with a Millennium 120 MLC. Dose profile scans of those fields